

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



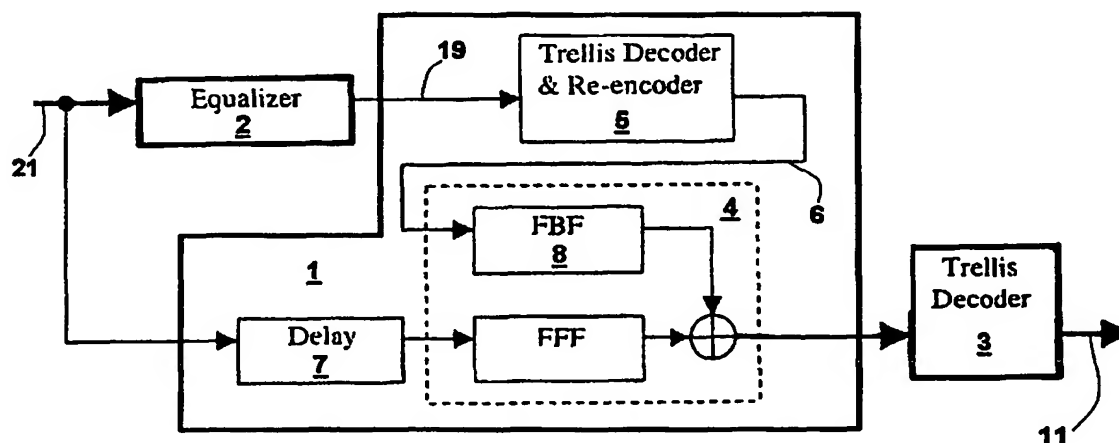
(43) International Publication Date
30 October 2003 (30.10.2003)

PCT

(10) International Publication Number
WO 2003/090439 A3

- (51) International Patent Classification⁷: **H04L 27/01**, 27/06, H04N 7/66, 11/24
- (21) International Application Number: **PCT/US2003/010888**
- (22) International Filing Date: **9 April 2003 (09.04.2003)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:
60/373,008 **16 April 2002 (16.04.2002)** **US**
- (71) Applicant (for all designated States except US): **THOMSON LICENSING S.A.** [FR/FR]; 46, Quai A. Le Gallo, F-92648 Boulogne (FR).
- (71) Applicant and
(72) Inventor: **HEO, Seo, Weon** [KR/KR]; 127-18 Gaebong-bon-Dong, Guro-Gu, 152-090 South Korea (KR).
- (72) Inventors; and
(75) Inventors/Applicants (for US only): **PARK, Jeongsoo** [KR/US]; 738 Young Graduate House, West Lafayette, IN 47906 (US). **GELFAND, Saul, Brian** [US/US]; 70 Sugar Maple Court, Lafayette, IN 47905 (US). **MARKMAN, Ivonete** [BR/US]; 11388 Royal Court, Carmel, IN 46032 (US).
- (74) Agents: **TRIPOLI, Joseph, S. et al.**; c/o Thomson Licensing Inc., 2 Independence Way - Suite 2, Princeton, NJ 08540 (US).
- (81) Designated States (national): **AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.**
- (84) Designated States (regional): **ARIPO** patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), **Eurasian** patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), **European** patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), **OAPI** patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:**
— with international search report
- (88) Date of publication of the international search report:
8 April 2004
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **CONCATENATED EQUALIZER/TRELLIS DECODER ARCHITECTURE FOR AN HDTV RECEIVER**



(57) Abstract: A concatenated equalizer/trellis decoding system for use in processing a High Definition Television signal. The re-encoded trellis decoder output (6), rather than the equalizer output (19), is used as an input to the feedback filter (8) of the decision feedback equalizer (4). Hard or soft decision trellis decoding may be applied. In order to account for the latency associated with trellis decoding and the presence of twelve interleaved decoders, feedback from the trellis decoder to the equalizer is performed by replicating the trellis decoder and equalizer hardware in a module (1) that can be cascaded in as many stages as needed to achieve the desired balance between complexity and performance. The present system offers an improvement of between 0.6 and 1.9 decibels. Cascading of two modules (1) is usually sufficient to achieve most of the potential performance improvement.

WO 2003/090439 A3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/10888

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H04L 27/01, 27/06; H04N 7/66, 11/24

US CL : 348/726; 375/321, 341, 346

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/726; 375/321, 341, 346

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
EAST: ("dfe" or "decision feedback") and "trellis"

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
IEEE: ("dfe" or "decision feedback") and "trellis"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	ZHUANG, W. et al, "Adaptive Soft-Decision Feedback Equalization for Indoor Radio Communications Using Trellis-Coded CPFSK", 44th IEEE Vehicular Technology Conference, June 1994, pages 1364-1368, especially Figure 2.	1, 10, 18
A	US 5,056,117 A (GITLIN et al) 08 October 1991 (08.10.1991), figure 5.	1, 10, 18
A	US 5,353,307 A (LESTER et al) 04 October 1994 (04.10.1994), figure 5B.	1, 10, 18
A	US 5,453,797 A (NICOLAS et al) 26 September 1995 (26.09.1995), column 5 line 55 to column 6 line 10, column 8 lines 32-41, column 9 lines 41-49, column 13 lines 12-16, figures 9 and 11.	1, 10, 18



Further documents are listed in the continuation of Box C.



See patent family annex.

<p>* Special categories of cited documents:</p>	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search	Date of mailing of the international search report
08 December 2003 (08.12.2003)	17 DEC 2003
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703)305-3230	Authorized officer Stephen M. Baker Telephone No. (703) 305-3800